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July 19, 2001

Assistant Commissioner for Patents
Washington, DC 20231

SUBJECT: Applicant: R.E. Creek
Serial No: 09/879,594
Filed: June 12, 2001
For: AN ASPHERIC SCREEN FOR
VISUAL DISPLAY APPARATUS
Docket No: GJ-222J

Dear Sir:

Enclosed is a certified copy of United Kingdom Patent Application No. 0014672.0 filed on June 15, 2000, which is the priority document for the subject application.

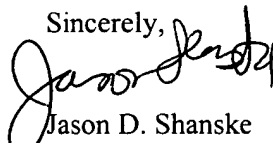
If for any reason this document is found to be INCOMPLETE, or if at any time it appears that a TELEPHONE CONFERENCE with counsel would help advance prosecution, please telephone the undersigned or his associates, collect in Waltham, Massachusetts (781) 890-5678.

If any payment during prosecution is found to be incorrect, please charge any deficiency or credit any overpayment to my Deposit Account No. 09-0002. A copy of this letter is enclosed for use by the Finance Branch in the event that it is necessary to make any charge or credit to my deposit account.

In addition, pursuant to Rule 1.136(a)(3), the Office is hereby authorized to treat any future reply requiring an extension of time as incorporating a request therefor. Also, any request or Petition for an Extension of Time notwithstanding an inadvertent reference in the Petition to a shorter period of time is to be treated as requesting the appropriate length of time.

Kindly acknowledge receipt of the foregoing by returning the enclosed self-addressed postcard.

Sincerely,


Jason D. Shanske
Reg. No. 43,915

JDS:dg
Enclosure

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INVESTOR IN PEOPLE

The Patent Office
Concept House
Cardiff Road
Newport
South Wales
NP10 8QQ

I, the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation & Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as originally filed in connection with the patent application identified therein.

In accordance with the Patents (Companies Re-registration) Rules 1982, if a company named in this certificate and any accompanying documents has re-registered under the Companies Act 1980 with the same name as that with which it was registered immediately before re-registration save for the substitution as, or inclusion as, the last part of the name of the words "public limited company" or their equivalents in Welsh, references to the name of the company in this certificate and any accompanying documents shall be treated as references to the name with which it is so re-registered.

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Signed

Dated 12th June 2001



16 JUN 00 E54 17-4 001821
P01/7700 0 001672.0

Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

The Patent Office

Cardiff Road
Newport
Gwent NP9 1RH

1. Your reference

2613

2. Patent application number
(The Patent Office will fill in this part)

0014672.0

15 JUN 2000

3. Full name, address and postcode of the or of each applicant (underline all surnames)

SEOS DISPLAYS LIMITED,
EDWARD WAY,
BURGESS HILL,
WEST SUSSEX, RH15 9UE,
UNITED KINGDOM.

Patents ADP number (if you know it)

If the applicant is a corporate body, give the country/state of its incorporation

UNITED KINGDOM

4. Title of the invention

IMPROVED VISUAL DISPLAY APPARATUS

5. Name of your agent (if you have one)

Address for service in the United Kingdom to which all correspondence should be sent (including the postcode)

GRAHAM JONES & COMPANY
77 BEACONSFIELD ROAD,
BLACKHEATH,
LONDON SE3 7LG

Patents ADP number (if you know it)

2097001

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number

Country

Priority application number
(if you know it)

Date of filing

(day / month / year)

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application

Date of filing

(day / month / year)

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'Yes' if:

- a) any applicant named in part 3 is not an inventor, or
- b) there is an inventor who is not named as an applicant, or
- c) any named applicant is a corporate body.

See note (d))

YES

9. Enter the number of sheets for any of the following items you are filing with this form. Do not count copies of the same document

Continuation sheets of this form

Description

2

Claim(s)

Abstract

Drawing(s)

2

22

10. If you are also filing any of the following, state how many against each item.

Priority documents

Translations of priority documents

Statement of inventorship and right to grant of a patent (Patents Form 7/77)

2

Request for preliminary examination and search (Patents Form 9/77)

Request for substantive examination (Patents Form 10/77)

Any other documents (please specify)

11.

I/We request the grant of a patent on the basis of this application.

Signature

GRAHAM JONES & COMPANY

Date

15/6/00

12. Name and daytime telephone number of person to contact in the United Kingdom

GRAHAM H. JONES
EUROPEAN PATENT ATTORNEY
CHARTERED PATENT ATTORNEY
TRADE MARK ATTORNEY

020 8858 4039

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After an application for a patent has been filed, the Comptroller of the Patent Office will consider whether publication or communication of the invention should be prohibited or restricted under Section 22 of the Patents Act 1977. You will be informed if it is necessary to prohibit or restrict your invention in this way. Furthermore, if you live in the United Kingdom, Section 23 of the Patents Act 1977 stops you from applying for a patent abroad without first getting written permission from the Patent Office unless an application has been filed at least 6 weeks beforehand in the United Kingdom for a patent for the same invention and either no direction prohibiting publication or communication has been given, or any such direction has been revoked.

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- If there is not enough space for all the relevant details on any part of this form, please continue on a separate sheet of paper and write "see continuation sheet" in the relevant part(s). Any continuation sheet should be attached to this form.
- If you have answered 'Yes' Patents Form 7/77 will need to be filed.
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- For details of the fee and ways to pay please contact the Patent Office.



Statement of inventorship and of right to grant of a patent

The Patent Office

Cardiff Road
Newport
Gwent NP9 1RH

1. Your reference Jg-2613

2. Patent application number 0014672.0
(if you know it)

15 JUN 2000

3. Full name of the or of each applicant

SEOS DISPLAYS LIMITED

4. Title of the invention

IMPROVED VISUAL DISPLAY APPARATUS

5. State how the applicant(s) derived the right from the inventor(s) to be granted a patent

BY VIRTUE OF AGREEMENT AND
CONDITIONS OF EMPLOYMENT

6. How many, if any, additional Patents Forms 7/77 are attached to this form?
(see note (c))

1

7. I/We believe that the person(s) named over the page (and on any extra copies of this form) is/are the inventor(s) of the invention which the above patent application relates to.

Signature

Graham Jones
GRAHAM JONES & COMPANY

Date

15/6/00

8. Name and daytime telephone number of person to contact in the United Kingdom

**GRAHAM H. JONES
EUROPEAN PATENT ATTORNEY
CHARTERED PATENT ATTORNEY
TRADE MARK ATTORNEY**

0208 858 4039

Notes

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- Write your answers in capital letters using black ink or you may type them.
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- When an application does not declare any priority, or declares priority from an earlier UK application, you must provide enough copies of this form so that the Patent Office can send one to each inventor who is not an applicant.
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Enter the full names, addresses and postcodes of the inventors in the boxes and underline the surnames

ROY EDWARD CREEK
37 WEST POINT,
NEWICK,
EAST SUSSEX, BN8 4NU,
UNITED KINGDOM.

Patents ADP number (if you know it): 64 43708001

Patents ADP number (if you know it):

Patents ADP number (if you know it):

Reminder

Have you signed the form?

Improved Visual Display Apparatus

This invention relates to visual display systems and in particular to visual display systems for simulations used for training, research, leisure or entertainment.

It is well known to use large collimated displays in such simulators. It is well known that such displays may conveniently be formed from a large tilted, concave mirror wrapped around the simulator cockpit, which collimates an image projected onto a large screen wrapped around the upper part of the cockpit above the windows. The screen may be front-projected or back-projected.

For convenience and economy, the collimated image provided by the display should be visible from the full cockpit volume. In particular, an image of good quality and correct perspective should be visible to both pilots in a wide-bodied aircraft simulator.

To enhance the realism of such simulators, the field of view of the display should be as large as possible. Horizontal fields of view of 180° to 225° are common. Vertical field of view of 40° is most common, with 45° , 50° , 55° and 60° also in use. It is known that for typical wide-bodied cockpits, 40° vertical field of view may be satisfactorily achieved with a spherical mirror of about 3m radius and a spherical screen. A vertical field of view of 50° may be achieved with the same radius mirror, but the screen must become aspheric. For 60° vertical field, not only must the screen become aspheric, but also the mirror radius must increase to about 3.3m. Symmetry considerations arising from the large horizontal field of view and issues of manufacturing complexity mean that both mirror and screen are surfaces of revolution about a vertical axis (not necessarily a common axis). A typical aspheric screen shape would be a torus.

It will be appreciated that as the display system becomes larger, it becomes more costly to manufacture and its greater mass imposes an increasing load on the simulator. Also, since such simulators are usually mounted on some kind of motion system, the motion envelope expands, requiring a larger, more expensive building to house the simulator. It will also be appreciated that the large collimating mirror should be as lightweight as possible and preferably in one piece (so as not to introduce gaps in the field of view). It is well known to form this mirror from a stretched, aluminised plastic sheet. Sheet of adequate quality is only available up to a certain width, which also limits the size of the system.

A 60° vertical field of view is found to be particularly useful for helicopter simulators, where it is typically disposed 20° up and 40° down. It is found that such a display system can be realised within the constraints mentioned above. Such a large vertical field of view would be useful in other applications, perhaps disposed equally about the horizon, or with an upward bias. A 35° up, 25° down disposition would be of great interest for in-flight refuelling simulation. However, it is found that a collimated image of adequate quality cannot be obtained within the constraints mentioned above for such a field of view disposition.

It is the aim of this invention to provide a larger vertical field of view with no downward bias without substantial increase in the size or complexity of the collimated display system.

Accordingly, the present invention provides a means to make an aspheric screen that is not a surface of revolution about an axis. Conceptually, the screen begins as a surface of revolution, which is split along its median section, the two parts separated and a short cylindrical centre

section inserted. The width of the cylindrical section is a further design parameter that can be used to achieve a more advantageous trade-off between field of view and image quality.

An embodiment of the invention will now be described solely by way of example and with reference to the accompanying drawings in which:

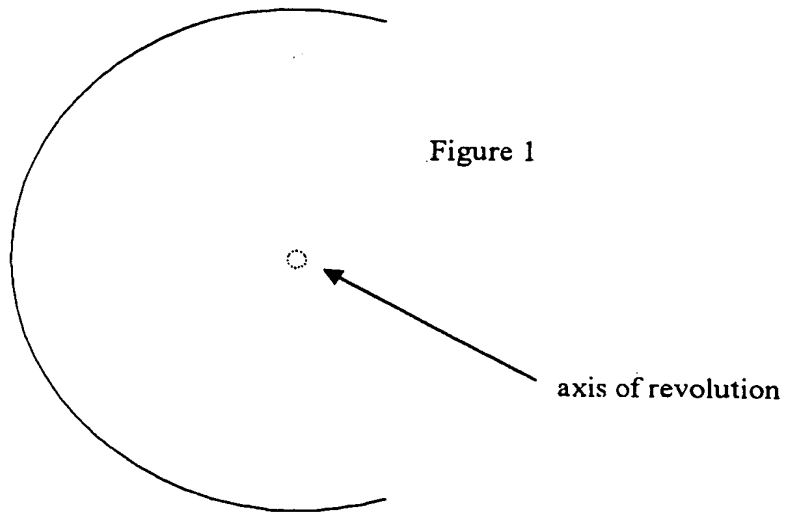
Figure 1 shows a circular horizontal section through a known screen shape.

Figure 2 shows the screen of Figure 1 conceptually split and separated.

Figure 3 shows the screen of this invention with the central cylindrical section inserted (still in horizontal section).

It will be appreciated that known screen shapes formed as surfaces of revolution will be circular in this cross-section, and that the central cylindrical segment of this invention will appear as a straight line in this view.

1/2



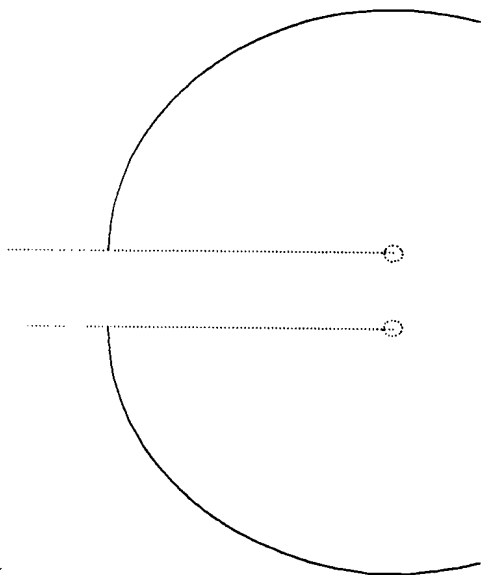


Figure 2

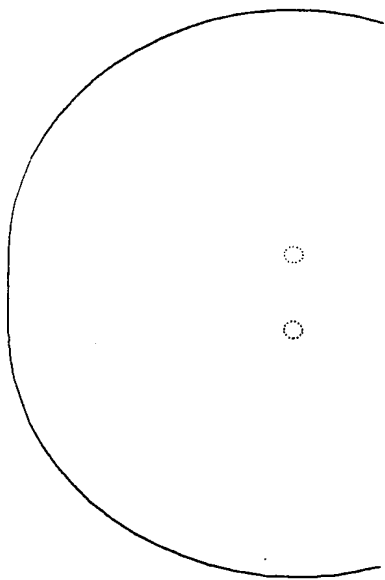


Figure 3

